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Immediate Obturator Stabilization Using Mini Dental Implants

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Abstract

Edentulous patients with maxillary defects face a more challenging oral rehabilitation process than dentate patients. With the use of mini dental implants (MDIs), it is now possible to immediately increase obturator retention and stability. Implant patients can have a retentive obturator that enhances the overall efficacy of the prosthesis both in comfort and function.

Restoration of an edentulous patient with a maxillary defect poses a challenge to the treating prosthodontist. Without teeth to provide clasping, the prosthodontist has to rely on other means for retention and stabilization of the obturator. Brown advocates extensive use of the lateral walls of the defect to stabilize the prosthesis.[1] Several other authors have suggested resilient materials to engage key mucosal soft tissue undercuts to provide stabilization and retention,[2-6] and additional authors have advocated using conventional implants to retain and support the prosthesis.[7-14] This report describes the use of mini dental implants (MDIs) placed coincident with a maxillectomy to aid in stabilization of the edentulous obturator.

Clinical report

An 81-year-old, Caucasian male patient presented on referral from the Otolaryngology Head and Neck service with a diagnosis of a 3-cm, $T_2N_0M_0$, poorly differentiated squamous cell carcinoma of the right maxilla and sinus, approximating the bicuspid region and extending posteriorly to the hamular notch (Fig 1). Prior medical history was noncontributory; the patient was not taking any medications at the time of referral and had no known drug allergies. The patient was completely edentulous in the maxilla and had a partially edentulous mandible with right and left cuspids present. The patient wore a complete maxillary denture, which had been recently relined, and an acceptably fitting and retentive mandibular removable partial denture (RPD). A panoramic radiograph was obtained to evaluate the bone available for implant placement. The patient consented to placement of MDIs at the time of resection.

Two irreversible hydrocolloid impressions of the maxillary arch were made and poured in vacuum-mixed type III stone; the first for a permanent preoperative record and the second for a working cast. A surgical obturator was then fabricated using the working cast and the procedures demonstrated by Huryn and Piro[15] with the following modification to the aforementioned procedure: a wax rim, 6 mm high and 10 mm wide measured from the top of the ridge, was attached to the cast at the site of the proposed implants, and visible light-cured resin was used to fabricate the prosthesis. This wax rim forms a relieved trough

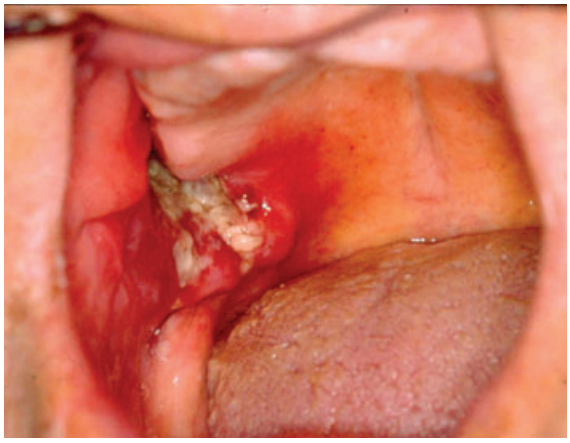

Figure 1 Preoperative photograph of maxillary tumor.

to fit over the implants and allows for complete seating of the surgical obturator (Fig 2).

At the time of resection, four MDIs (MDI-MAX™, IMTEC Corp., Ardmore, OK), 2.4 × 13 mm, were placed in the remaining maxilla. The implants were placed parallel to one another at a distance of 6 mm from the center of the adjacent implant. The number of implants will vary relative to the amount of remaining maxilla and in relationship to the maxillary sinus. Patients benefit from the placement of as many implants as possible. The implant sites were prepared using the 1.1-mm pilot drill to perforate the maxilla. The depth of the osteotomy sites is less than 3 mm, which provides maximum engagement of the implant to the bone. The finger driver was used for the initial seating, and once significant resistance was met, the winged thumb wrench was used until the implant would not advance any further. Finally, the ratchet wrench was used to complete the seating of the implant. All the threads were subgingival with only the collar of the implant and the retentive o-ball protruding. The implants were placed while waiting for the results of frozen sections, which did not extend the overall operative

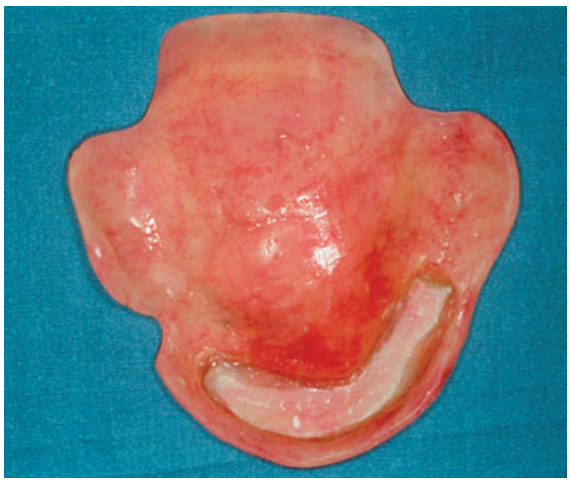

Figure 2 Surgical obturator with trough to fit over implants.

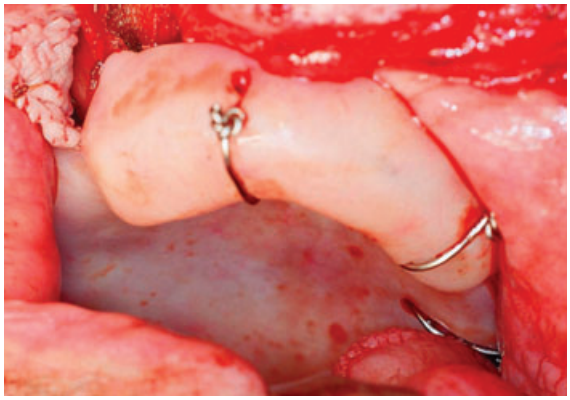

Figure 3 Ligated surgical obturator covering the immediate implants.

time. Once the implants were placed, the surgical obturator was fixed to the remaining maxillary ridge with 24-gauge stainless steel ligature wire (Fig 3).

On postoperative day 5, the surgical obturator and packing was removed. The mouth was gently cleaned, and a postoperative panoramic radiograph and intraoral photographs were completed (Figs 4 and 5). At this point, the existing denture was modified and converted into the interim obturator prosthesis. Pressure-indicating paste was placed on the top of the o-ball, and the obturator was marked for the approximate implant location. The internal aspect of the denture was relieved to allow complete seating of the prosthesis intraorally with the retentive o-ring housings in place. The obturator portion was then formed with tissue conditioner (COE Comfort, Dentsply, York, PA) and trimmed to fit. Once the defect was sufficiently obturated, the retentive housings were incorporated into the prosthesis using autopolymerizing acrylic resin (Fig 6). The occlusion was adjusted using articulating paper and having the patient close. Over the ensuing weeks, the patient's range of motion improved, and the occlusion was further equilibrated with a clinical remount.

Upon successfully forming the obturator prosthesis and incorporating the retentive housings, the patient was instructed on the insertion, removal, and care of the prosthesis and implants. Removal should take place using both hands bilaterally and pulling straight down off the implants. Insertion takes some practice, but after a few days in front of the mirror the patient

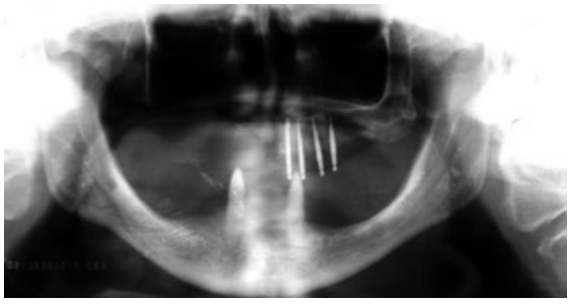

Figure 4 Postoperative Panorex demonstrating the mini implants in the remaining maxilla.

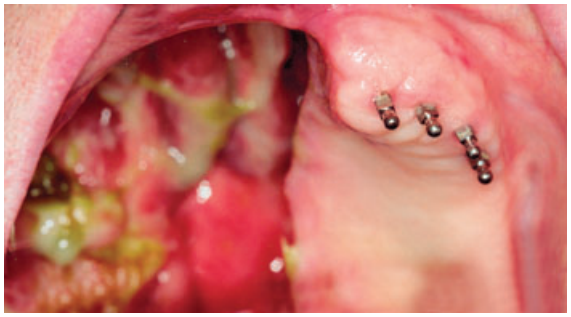

Figure 5 Postoperative intraoral photograph of the immediate implants.

will be able to insert the prosthesis by feel. Using the dominant hand, have the patient use the prosthesis to move the cheek on the defect side laterally and direct the obturator portion first, the unaffected side can then be rotated into place. Once in the mouth, the patient will feel for the implants and press firmly in a superior direction using both hands until the prosthesis is fully seated. Discourage the patient from biting the prosthesis into place, as this could result in damage to the retentive o-rings, necessitating more frequent replacement.

Five weeks following surgery, the patient was treatment-planned for 33 fractions of external beam radiation therapy. Three months postradiation therapy, a primary impression of the maxilla and the surgical defect area was made with irreversible hydrocolloid for the fabrication of a definitive obturator. The impression was poured with type II stone, and the cast was used to construct a custom tray. The implant areas were marked with an indelible pen on the cast, which then transferred to the custom tray. Relief was provided in this area to ensure complete seating of the custom tray. The tray was then border molded, and a secondary impression was made with a 1:1 ratio of light and regular viscosity polysulfide. Once set, the impression material was removed from around the implants, and the metal retentive housings were placed on the implants. After roughing the custom tray with an acrylic bur, the retentive housings were

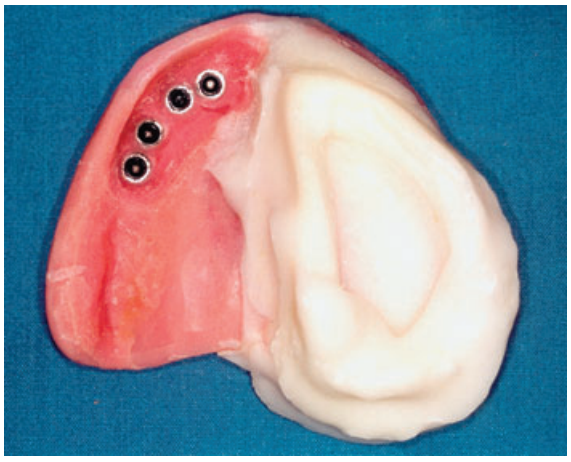

Figure 6 Completed interim obturator with resilient liner and incorporated o-ring housings.

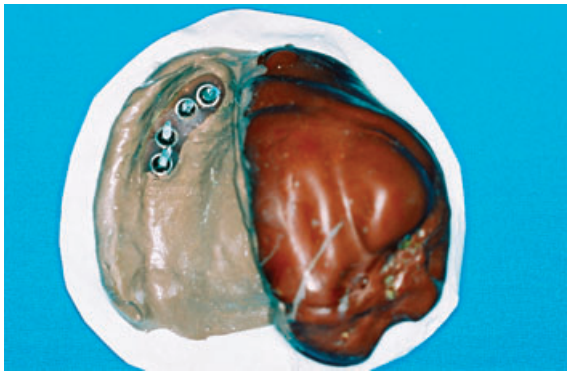

Figure 7 Secondary impression with laboratory analogs incorporated for the master cast.

attached using autopolymerizing acrylic resin as previously described. Implant analogues were placed into the incorporated housings, the impression was boxed, and type III stone was vacuum mixed and poured for the master cast (Fig 7). A base plate with o-ring housings was fabricated with a wax rim. Following wax rim modification, jaw relation records were made, and the casts were mounted. A wax trial denture was fabricated and tried in the patient's mouth to verify occlusal records, phonetics, and esthetics. Once the patient signed the consent for processing, the obturator was completed using heat-processed acrylic resin (Lucitone 199, Dentsply). The patient had experimented with a hollow and nonhollow designed obturator during the interim phase and was more comfortable with the nonhollow design. Using pressure-indicating paste, adjustments were made, and a remount was accomplished at the delivery appointment (Fig 8). The patient was then scheduled for recall appointments every 4 months, and after the 36-month follow-up period all the implants remain integrated without signs of mobility, radiolucency, or pain. The patient's oncologic and restorative prognosis is favorable and he will continue to be monitored for signs of recurrence or for implant failure.

Discussion

The MDI described is a 2.4-mm diameter, self-advancing, single piece, threaded, roughened surface, titanium alloy

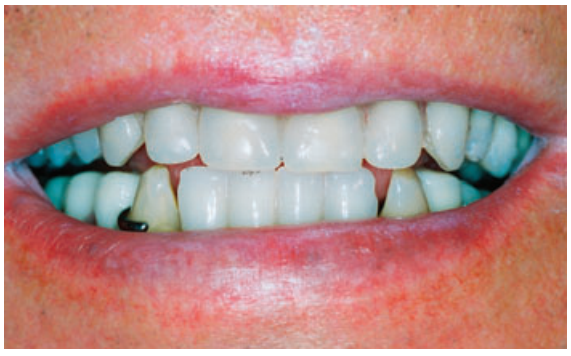

Figure 8 Completed treatment following surgery and radiation therapy.

(Ti-6Al-4V). This more open thread design allows for better penetration through cancellous bone compared to the smaller diameter, more-compact thread design used for denser bone.[16,17] This system differs from "transitional" or "modular" implants in that the surface treatment allows for osseointegration compared to transitional implant systems that have machine-polished titanium surfaces, which allow for counter torque removal once conventional implants have integrated.[18-28] Additionally, Kanie et al compared the mechanical properties of the mini transitional implant (MTI, Dentatus USA, New York, NY) and the MDI (IMTEC) and found that the MDI is stronger and more likely to integrate, making it suitable for long-term use.[29] Lastly, few reports are available describing the long-term success rate for MDIs.[30-32] These reports describe 32 2.4-mm × 13-mm—implants (Hi-Tec Implants, Herzlia, Israel) followed for 5 years; 27 total, 1.8-mm × 13-, 15-, and 17-mm, MDIs used as transitional implants followed for a median of 18 weeks; and a multi-institutional study of 1029 MDIs followed for 5 months to 8 years. The authors have an overall success rate of ≥92% but illustrate the disparity in reporting between short- and long-term survival and the need for further clinical research.

Once implanted, immediate use is of the utmost importance for patients needing oral rehabilitation of maxillectomy defects. Proper nutritional intake and the ability to communicate without nasality are necessary for physical and psychological healing. This immediate use is accomplished because the auto advancement thread pattern creates a stable, compacted bone interface rather then the bone healing toward the implant from a conventional osteotomy site. When conventional implants are placed in the maxilla, most practitioners will allow a minimum of 4 months healing time before second stage surgery is initiated, if the overall bone quality is favorable.[33] Some authors have suggested waiting 6 to 18 months following radiotherapy before placing conventional implants.[34] Although the exact timing of implant placement and restoration has not been established, using MDIs to enhance stabilization instantaneously improves the efficacy of the obturator.

Potential complications with this system are as with any implant system: bleeding, infection, discomfort, sinus perforation, nerve damage, lack of integration, mechanical overload, and soft tissue edema.

Note: The system described here now includes impression copings and brass analogs that accurately reproduce the implants and their positions for the master cast. At the time of this procedure, however, the impression copings were in development, so the choices were to register the implants in the impression material or in the housings.

Conclusion

Some practitioners find the use of mini implants controversial, as long-term survival data is sparse; however, immediate improvement in stabilization and retention of obturators can be accomplished with their aid. Placing these implants, preferably at the time of the ablative surgery, will shorten or hasten the recovery process of the edentulous patient as the obturator will be more efficacious. If planned in conjunction with the surgical team, the implants can be placed with little to no extension of the overall operative time. The patient can then begin adapting to the stable interim prosthesis quickly following packing removal and may be rehabilitated to a near presurgical level.[35]

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